

## BIOFILTRATION/RAIN GARDEN

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Revised February 2007

The biofiltration methods described in the following section are based on the bioretention design found in the Maryland Stormwater Design Manual, and where deemed appropriate, have been modified by the Montgomery County Department of Permitting Services.

### A. Facility Description

Biofiltration is a soil filtration system. Principal components of the system (*figures 1&2*) include: a.) a pre-treatment grass filter strip, b.) surface planting with woody and herbaceous plant species, c.) a surface 2-3 inch thick mulch layer, d.) a minimum 18 inch thick planting media (See specifications), e.) a 6 inch thick sand layer, and f.) perforated PVC pipe underdrain within a 10 inch thick gravel bed. The entire system can fit into a relatively confined space.

It is strongly recommended that stormwater runoff sheetflow through a grass filter strip into the ponding area. A maximum 12-inch deep ponding depth has been selected so as to reduce the likelihood of creating saturated-soil/anoxic conditions within the system. The perforated PVC pipe underdrain system provides proper drainage and aeration of the planting soil filter layer.

### B. System Design Considerations

#### 1. Design Storm

The facility must be sized to provide storage for the required volume

### C. Specifications and Details

#### 1. Sizing

The facility must be sized to store the required drainage volume. The maximum ponding depth above the filter bed area should not exceed 12-inches. Storage is computed above the surface of the facility. The top of the filter media must be level across its entire surface. The side slopes of the facility should be 3:1 or flatter.

To the extent possible, structures should have irregular outlines to blend naturally into the environment. Rectangular is not natural.

#### 2. Underdrain Pipe

The underdrain pipe consists of 4-inch diameter perforated pipe at 0.00% slope. The underdrain pipe will be placed within the gravel layer. A minimum of 2 inches of gravel must be placed under the pipe, with a minimum of 4 inches of gravel over the pipe. Filter fabric must **not** be wrapped around the underdrain pipe.

### **3. Gravel Bed**

The gravel layer surrounding the underdrain pipe(s) must meet MSHA size #7 (Table 901A), and must provide a minimum of 4 inches cover over the pipe(s), and minimum 2 inches under the pipe. No geotextile or filter fabric is allowed anywhere within the filter media (stone and sand).

### **4. Sand Bed**

A minimum 6-inch fine aggregate sand layer shall be provided below the soil filter/planting media. ASTM C33 Fine Aggregate Concrete Sand is required. Manufactured sand or stone dust is not acceptable.

### **5. Overflow**

Overflows may either be collected in a yard inlet and piped to an acceptable outfall, or they may be allowed to overflow the facility and sheet flow through grass to an acceptable location.

### **6. Soil Filter/Planting Media**

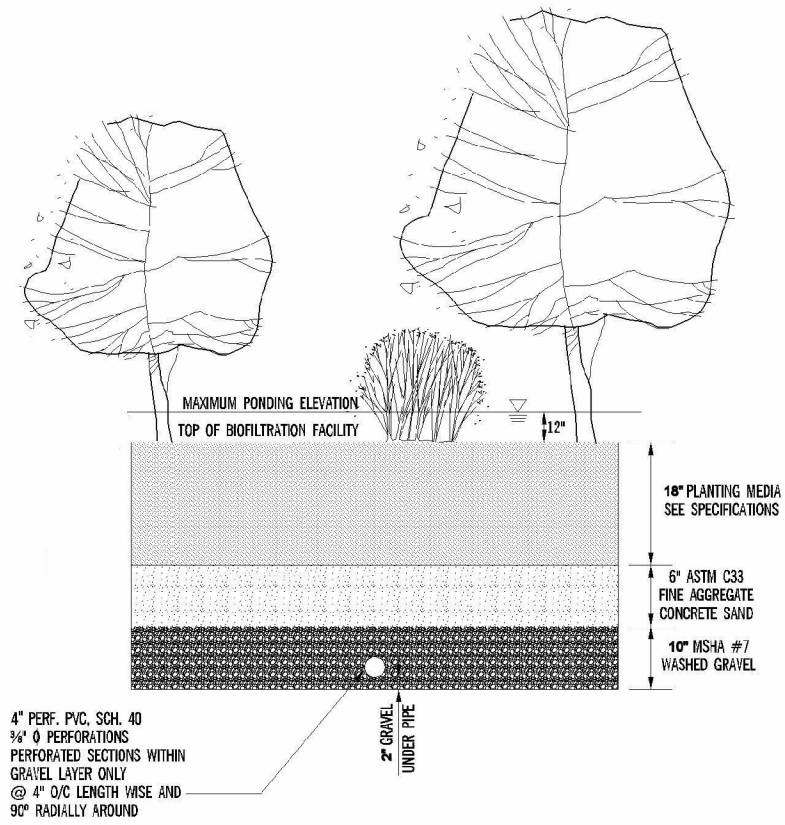
The planting media shall consist of 1/3 perlite, Solite, or sand, 1/3 compost and 1/3 topsoil. The perlite shall be coarse grade horticultural perlite. The compost shall be high grade compost free of stones and partially composted woody material. The soil shall meet the following minimum criteria: contain no more than 10% clay, 30 – 55% silt and 35 – 60% sand. The soil shall be free of stones, stumps, roots or other similar objects larger than 2 inches. The first layer of the planting media shall be lightly tilled to mix it into the sand layer, so not to create a definitive boundary. The planting material shall be flooded after placement. Any settlement that occurs shall be filled back to the design elevation.

### **7. Mulch**

The surface mulch layer will consist of standard fine shredded aged hardwood mulch. The mulch should be applied uniformly to a depth of 2 to 3 inches. Yearly replenishment may be necessary.

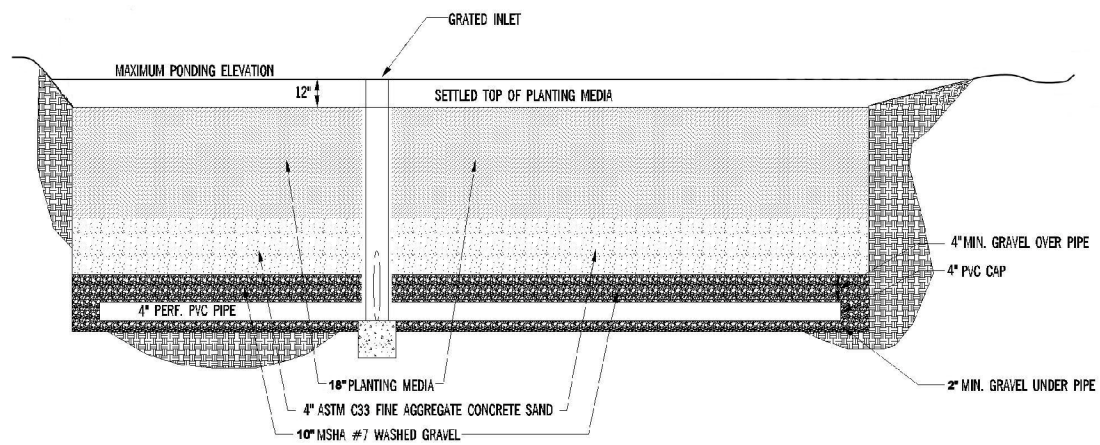
### **8. Plant Materials**

Plants, through their evapotranspiration of runoff, play a key role in the overall effectiveness of the biofiltration device. The number and type of tree and shrub plantings for the system may vary, especially where aesthetics or other considerations are critical to site development. While native plants are encouraged, they are not always appropriate in all situations. While no hard planting rule exists, the plants should be a mix of trees, shrubs and herbaceous materials. However, there should be 2 to 3 shrubs planted per tree and herbaceous plantings should make up about 40 % of the total number of plants.



**TYPICAL CROSS-SECTION  
THROUGH BIOFILTRATION  
(PERPENDICULAR TO UNDER-DRAIN)  
FIGURE 1**

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**TYPICAL CROSS-SECTION  
THROUGH BIOFILTRATION  
(PARALLEL TO UNDER-DRAIN)  
FIGURE 2**

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